

$$\textcircled{A} \times 10^n$$

↖ 1 - 10 ↗
included Not included

$$23.5 \times 10^6 \quad \text{X}$$

$$1 \times 10^7 \quad \checkmark$$

$$2.35 \times 10^6 \quad \checkmark$$

$$10 \times 10^7 \quad \text{X}$$

$$0.235 \times 10^6 \quad \text{X}$$

WE CAN MOVE DECIMAL AND POWER CHANGES.

DECIMAL MOVES RIGHT, POWER REDUCES

DECIMAL MOVES LEFT, POWER INCREASE.

CONVERT FOLLOWING INTO STANDARD FORM:

$$1) \quad 348.76 \times 10^{6+2} = 3.4876 \times 10^8$$

↖ 2 places left ↗

$$2) \quad 384. \times 10^{7+2} = 3.84 \times 10^9$$

↖ left ↗

$$3) \quad 0.0961 \times 10^{4-2} = 9.61 \times 10^2$$

↖ right ↗

$$4) \quad 1362.71 \times 10^{-5+3} = 1.36271 \times 10^{-2}$$

↖ left ↗

$$5) \quad 0.00971 \times 10^{-8-3} = 9.71 \times 10^{-11}$$

↖ right ↗

ADD / SUBTRACT

MAKE POWERS OF TEN SAME

EXAM TIP: ALWAYS MAKE SMALLER POWER.

THE WORKING BECOMES SIMPLER.

$$1) (3.6 \times 10^7) + (2 \times 10^6)$$

$$(3.6 \times 10^{7-1}) + (2 \times 10^6)$$

$$36 \times 10^6 + 2 \times 10^6$$

$$(36 + 2) \times 10^6$$

$$38 \times 10^{6+1} = \boxed{3.8 \times 10^7}$$

$$2) (2.1 \times 10^9) - (3 \times 10^7)$$

$$(2.1 \times 10^{9-2}) - (3 \times 10^7)$$

$$210 \times 10^7 - 3 \times 10^7$$

$$(210 - 3) \times 10^7$$

$$207 \times 10^{7+2}$$

$$\boxed{2.07 \times 10^9}$$

MULTIPLY

Numbers are multiplied

Powers of ten are added.

powers of ten = ADD

$$1) (1.2 \times 10^6) \times (8 \times 10^5)$$

Multiply

$$\begin{array}{r} 1.2 \\ \times 8 \\ \hline 9.6 \end{array} = \boxed{9.6 \times 10^{11}}$$

DIVIDE

Numbers are divided

Powers of ten are subtracted.

subtract.

$$2) (6.3 \times 10^8) \div (9 \times 10^3)$$

divide.

$$\frac{6.3 \times 10^8}{9 \times 10^3} = \frac{63}{9} \times 10^{8-3} = 0.7$$

$$0.7 \times 10^{5-1}$$

$$\boxed{7 \times 10^4}$$

ARRANGING

ARRANGE FOLLOWING IN INCREASING ORDER
STARTING FROM SMALLEST.

Rule: Make powers of ten same. (Bring to smallest power).

$$\begin{array}{cccc}
 213.7 \times 10^5 & , & 19.3 \times 10^6 & , & 3.2 \times 10^7 & , & 21.1 \times 10^6 \\
 & & 19.3 \times 10^{6-1} & , & 3.2 \times 10^{7-2} & , & 21.1 \times 10^{6-1} \\
 \hline
 \boxed{213.7 \times 10^5} & & \boxed{193 \times 10^5} & & \boxed{320 \times 10^5} & & \boxed{211 \times 10^5} \\
 \textcircled{3} & & \textcircled{1} & & \textcircled{4} & & \textcircled{2}
 \end{array}$$

Note: Always write the original values in the answer space.

Ans: $\frac{19.3 \times 10^6}{\text{Smallest}}, \frac{21.1 \times 10^6}{}, \frac{213.7 \times 10^5}{}, \frac{3.2 \times 10^7}{\text{Largest}}.$

PRACTICE:

TYPE 1: WITHOUT WORD PROBLEMS.

- 1 (a) Express $217.3 \times 10^{+2}$ in standard form.

$$2.173 \times 10^4$$

Answer (a) 2.173×10^4 (cao) [1]

- (b) Arrange the following numbers in order starting with the smallest.

$$\begin{array}{cccc}
 217.3 \times 10^2 & , & 22.6 \times 10^3 & , & 0.031 \times 10^5 & , & 2.5 \times 10^4 \\
 & & 22.6 \times 10^{3-1} & , & 0.031 \times 10^{5-3} & , & 2.5 \times 10^{4-2} \\
 \hline
 \boxed{217.3 \times 10^2} & & \boxed{226 \times 10^2} & & \boxed{31 \times 10^2} & & \boxed{250 \times 10^2} \\
 \textcircled{2} & & \textcircled{3} & & \textcircled{1} & & \textcircled{4}
 \end{array}$$

Answer (b) $0.031 \times 10^5, 217.3 \times 10^2, 22.6 \times 10^3, 2.5 \times 10^4$ [2]

- 9 It is given that $m = 2.1 \times 10^7$ and $n = 3 \times 10^4$.
Expressing your answers in standard form, find

(a) $m \div n$,

(b) $n^2 + m$.

(i) $(2.1 \times 10^7) \div (3 \times 10^4)$
Divide

$$\frac{2.1}{3.0} = \frac{21}{30} = \frac{7}{10} = 0.7$$

$$0.7 \times 10^{3-1}$$

$$\boxed{7 \times 10^2}$$

(ii) $n^2 + m$
 $(3 \times 10^4)^2 + (2.1 \times 10^7)$

$$9 \times 10^{8-1} + 2.1 \times 10^7$$

$$90 \times 10^7 + 2.1 \times 10^7$$

$$(90 + 2.1) \times 10^7 = 92.1 \times 10^{7+1} = \boxed{9.21 \times 10^8}$$

Answer (a) 7×10^2 [1]

(b) 9.21×10^8 [2]

TYPE 2: SCENARIO BASED.

You just read and check whether it is

ADD / SUB / MULTIPLY / DIVIDE.

- 3 The population of a country is 3.2×10^6 .
There are 8×10^5 children.

- (a) What fraction of the whole population are children? = $\frac{\text{child}}{\text{whole}}$
Give your answer in its simplest form.

- (b) Find the number of adults.
Give your answer in standard form.

(i) $\frac{C}{W} = \frac{8 \times 10^5}{3.2 \times 10^6}$
 $= \frac{8}{3.2 \times 10}$
 $= \frac{8}{32} = \frac{1}{4}$

(b) Adults = Whole - Child.
 $= (3.2 \times 10^{6-1}) - (8 \times 10^5)$
 $= 32 \times 10^5 - 8 \times 10^5$
 $= (32 - 8) \times 10^5$
 $= 24 \times 10^{5+1} = 2.4 \times 10^6$

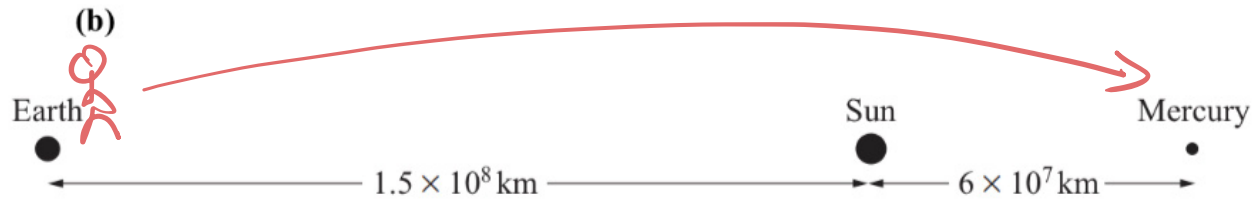
Answer (a) [1]

(b) 2.4×10^6 [1]

- 5 The distance from the Earth to the Sun is e kilometres, where $e = 1.5 \times 10^8$.
The distance from the Sun to Mercury is m kilometres, where $m = 6 \times 10^7$.

(a) Express $e : m$ as the ratio of two integers in its simplest form.

Divide



The diagram shows when the Earth, the Sun and Mercury are in a straight line, with the Sun between the Earth and Mercury.

Find the distance from the Earth to Mercury.

Give your answer in standard form.

i) $e : m$

$$\frac{e}{m} = \frac{1.5 \times 10^8}{6 \times 10^7}$$

$$= \frac{1.5 \times 10}{6}$$

$$= \frac{15}{6}$$

$$\frac{e}{m} = \frac{5}{2}$$

$$e : m = 5 : 2$$

$$\text{Add} = 1.5 \times 10^{8-1} + 6 \times 10^7$$

$$15 \times 10^7 + 6 \times 10^7$$

$$(15 + 6) \times 10^7$$

$$21 \times 10^{7+1}$$

$$\boxed{2.1 \times 10^8}$$

Answer (a) $5 : 2$ [1]

(b) 2.1×10^8 km [2]

Decimals

1) ADD/SUB:

$$1.73 + 2.6$$

$$\begin{array}{r} 1.73 \\ + 2.6 \\ \hline \end{array}$$

$$\begin{array}{r} 1.73 \\ + 2.60 \\ \hline 4.33 \end{array}$$

2) 0.16×0.04 $2dp + 2dp = 4dp$

$$\begin{array}{r} 16 \\ \times 4 \\ \hline 64 \end{array}$$

1.2×8 $1dp + 0dp = 1dp$

$$\begin{array}{r} 12 \\ \times 8 \\ \hline 96 \end{array}$$

3) $\frac{1.6}{0.4} = \frac{16}{4} = 4$

$$\frac{0.16}{0.40} = \frac{16}{40} = 0.4$$

$$\frac{6.3}{9.0} = \frac{\cancel{6}37}{\cancel{9}010} = 0.7.$$